

**Report on 2004 Activities and Action Plan to Protect  
Northern Right Whales:  
Implementation of the Commonwealth's Right Whale Conservation Plan**

**Submitted to the**

**National Marine Fisheries Service  
National Fish and Wildlife Foundation  
Massachusetts Environmental Trust**



Photo by Ed Lyman

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**from**

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## **I. INTRODUCTION**

This report summarizes Massachusetts Division of Marine Fisheries (*Marine Fisheries*) Year 2004 North Atlantic Right Whale Conservation Program and its support of the federal Large Whale Take Reduction Plan. The Commonwealth's Right Whale Conservation Program (RWCP) has continued to broaden its efforts since a 1996, court-appointed Endangered Whale Working Group provided that Massachusetts develop a plan to address the threats to North Atlantic right whales in state waters. The Commonwealth has done so, and what now exists is a comprehensive program, supported by several funding sources, that is well integrated with other jurisdictions and programs that have similar goals of protecting right whales. Thus, rather than providing separate reports to each funder on the various efforts that they supported, a comprehensive report was provided to encompass all efforts, accomplishments and costs attributed to the program as a whole.

## **II. FUNDING SOURCES**

Due to the scope of the program, funding for the 2004 calendar year was obtained from a variety of sources. These were the National Marine Fisheries Service (NMFS), the National Fish and Wildlife Foundation (NFWF), and the Massachusetts Environmental Trust (MET). NMFS awarded \$391,620 to fund *Marine Fisheries*' contract to the Center for Coastal Studies (CCS) for the Right Whale Surveillance and Monitoring Program in Cape Cod Bay (CCB) and adjacent waters. This included the purchase of an Optical Plankton Counter (OPC) to enhance habitat-monitoring efforts. The NFWF, along with NMFS, provided \$370,562 to support other core components of the Commonwealth's Right Whale Conservation Program. This included \$210,016 for support of a collaborative effort with Cornell University's Bioacoustics Research Program (BRP), the International Fund for Animal Welfare (IFAW) and the Woods Hole Oceanographic Institute (WHOI) to provide additional real-time, passive, acoustic monitoring of right whales in CCB; outreach; the profiling of fixed-fishing gear; and partial funding for a Program Coordinator to oversee the Commonwealth's highly successful and expanding program. The remaining \$160,546 was awarded by NFWF in 2003 to support a multi-year gear study along with the Atlantic Offshore Fishermen's Association (AOLA). The Massachusetts Environmental Trust awarded \$74,475 towards the Commonwealth's RWCP. This included \$36,475 of additional funds to support Dr. Christopher Clark's real-time acoustic monitoring of right whales in CCB; and \$38,000 to tag basking sharks as surrogates to right whales in the hope of learning more about the right whales distribution patterns.

## **III. CONSERVATION PLAN SPECIFICS AND ACCOMPLISHMENTS**

During the period January 1 – December 31, 2004 *Marine Fisheries*' Right Whale Conservation Program accomplished the following:

## **1. Surveillance, Habitat Monitoring, and Management**

*Marine Fisheries* as part of their management strategy, conducted, for the seventh consecutive year, the highly successful Surveillance, and Habitat Monitoring Program for North Atlantic Right Whales in Cape Cod Bay and adjacent waters for the period, January 1 - May 15, 2004. The majority of this program was executed through a contract to the Center for Coastal Studies and involved aerial and vessel-based surveillance, as well as habitat monitoring. All right whale sightings were communicated to the NMFS/ SAS system and the University of Rhode Island, home of the right whale database. Photo documentation of right whales was sent to the New England Aquarium (NEAq), curators of the right whale catalog. For the second year, habitat reports and forecasts on likelihood of right whale presence and residency in CCB were available in near real-time.

### **A. Right Whale Surveillance and Monitoring**

The program effectively monitored for the presence of right whales in Cape Cod Bay and adjacent state waters during winter and spring months. Right whale photo-documentation, demographics, habitat usage, and movement patterns were obtained, in addition to densities and distribution patterns. All aspects of the surveillance and monitoring program aid in the effective management of this highly endangered species. See report by Dr. Charles Mayo *et al*, 2004 for complete details ([Attachment A](#)).

Aerial surveillance of Cape Cod Bay and adjacent waters consisted of 27 flights, encompassing 138.5 flight hours and 7100 nm, between January 21, 2004 and May 10, 2004. A total of 367 right whale sightings were recorded, including vessel-based, of which 297 were photographed. To date, at least 55 different whales, including two mother calf pairs, have been identified from survey efforts during the 2004 season. All but one of these animals was sighted within CCB Critical Habitat. Analysis of the photographs suggest there were an additional 6 right whales in CCB during the 2004 season that have yet to be identified. The estimated 60 right whales sighted in CCB during the 2004 season is lower than the mean of 94 animals sighted by survey efforts between 1998 and 2001, but higher than the last two years, which were 24 and 49 respectively. The 2004 right whale distribution pattern and demographics in the Bay were similar to past years' aerial surveillance data with the exception of the 2002 season. Right whale sightings peaked in mid March, and distribution followed primarily the eastern portion of the Bay, from Barnstable Harbor northeast to Provincetown. The first right whales were sighted in CCB on February 10, while the last sighting of a solitary right whale was on May 10, for a minimum population residency time of 90 days during the surveillance season. While there were a small number of whales sighted during the month of May (May 6 – 4 rights, May 10- 1 right), surveillance efforts indicate that the majority of the animals departed CCB by the end of April. In fact, the last day a large number of right whales were seen (n=21) was on April 25 when most of the sightings were distributed NE of Race Point indicating a departure from CCB.

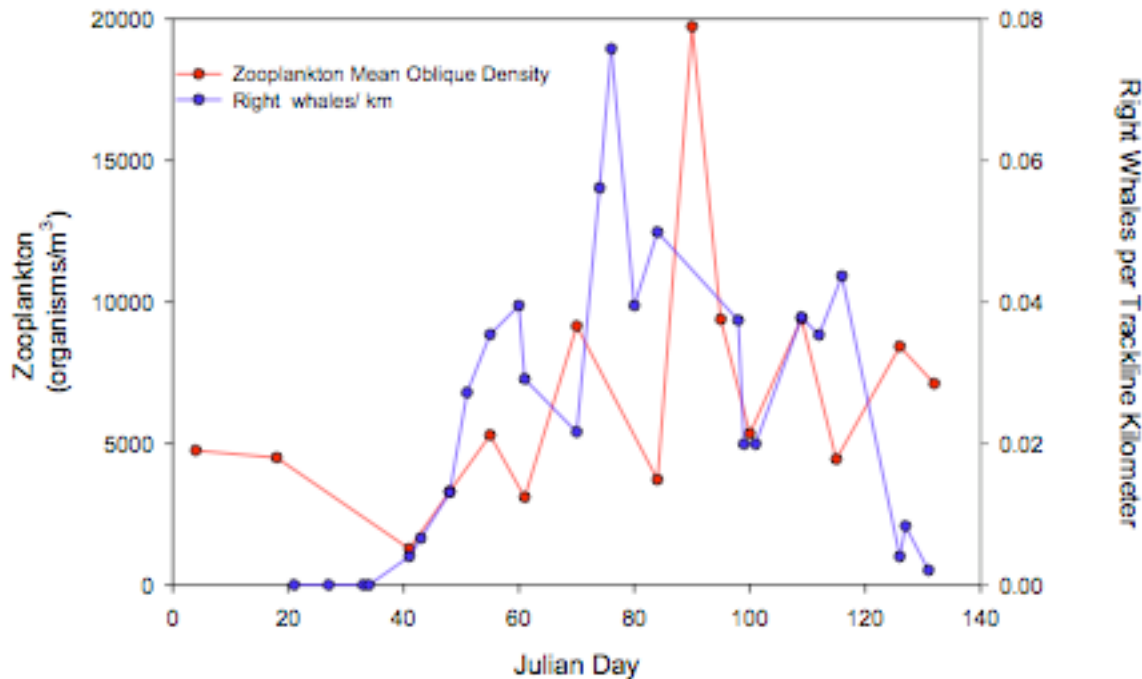
**Table 1: Number of Right Whales Documented in Cape Cod Bay and Adjacent Waters by Year**

<b>Year</b>	<b>Min. # of right whales for all survey efforts</b>	<b>Min. # of Right Whales Ided within CCBCH</b>	<b>Est. # of Right Whales seen in CCBCH</b>
1998	95	91	91
1999	101	86	91
2000	112	86	96
2001	107	87	95
2002	57	19	24
2003	81	27	49
2004	61	54	60

**B. Right whale habitat analysis and the utility of habitat sampling data to forecast right whale presence, and movement patterns in Cape Cod Bay.**

The Commonwealth continued to contract CCS to carryout habitat monitoring of Cape Cod Bay from January through mid May, or during the time right whales typically frequent the Bay. The monitoring provided a better understanding of the right whales' habitat requirements, and determination of the utility of biotic and abiotic habitat parameters to provide a reliable trigger to allow managers to forecast right whale presence, residency, and movement patterns in CCB. CCS carried out physical and biological oceanographic sampling of the Bay during 21 cruises, between Jan 4 and May 11, 2004, totaling nearly 150 hours at sea. Sampling included conductivity, temperature, depth profiler (CTD) casts, net tows, chlorophyll readings, and pump sampling and subsequent filtering of water samples at depth and along the surface. A total of 726 plankton samples were collected and 136 depth profiles recorded.

CCS continued to provide near real-time assessments of the right whales' food resource and forecasts of residency in CCB using four parameters of zooplankton richness. These reports, which provide an important management tool, were improved upon during the 2004 season by adding additional sampling stations. Rather than one station representing each quadrant of the Bay, CCS (on almost all cruises) was able to sample two stations per quadrant. The challenge was to balance a greater sampling effort, while maintaining near real-time reporting for management purposes. CCS, with increased effort, succeeded in meeting the challenge and assessment reports were still posted within 48 hours of sampling.



**Figure 1.** A comparison of mean zooplankton density estimated from samples collected from oblique tows in Cape Cod Bay as compared to right whale density calculated from aircraft surveys in the winter and spring of 2004 (CCS data).

Results of the sampling showed that CCB during the 2004 season generally maintained a rich zooplankton biomass. As in the 2003 season, zooplankton abundance during the early winter (January) was high – above threshold values shown to elicit feeding from right whales. Mid-water (0-19m) oblique resource displayed a consistently high density (mean daily values generally over 5,000 organisms per cubic meter), with a season peak at the end of March, which is typical of past seasons. Samples taken at greater depths (>19m), from vertical pump casts, identified an extraordinary resource, which from mid February to mid March, maintained densities of 90,000 organisms/m<sup>3</sup>. This is more than three times that seen during the 2000-2003 seasons. These peak densities were generally found between 28- 32m, with a secondary peak at 8-14m. Zooplankton of the *Pseudocalanus* complex dominated all other zooplankton species (both in surface and oblique tows) in both abundance and duration of residency, with an early entry into and a late departure from Cape Cod Bay. This abundance of *Pseudocalanus* sp. temporally matched the period of highest right whale density, indicating that it the primary food resource for the whales during the 2004 season. A large bloom of *Phaeocystis pouchetii* was documented during the 2004 season for two weeks (April 9 to 24). This bloom was the largest seen during any of the past four years. As in past seasons, it was the eastern two-thirds of the Bay that showed the highest and most stable zooplankton biomass, while western portions, including west of the Critical Habitat, generally showed low zooplankton biomass. Right whale distribution, as already mentioned, mirrored the high biomass of zooplankton over the eastern two-thirds of the Bay.

Although the densities of zooplankton were sufficiently high to support right whale feeding throughout the season (January – May), and *Calanus finmarchicus*, a rich food resource, increased to above threshold values at the end of the season (through May 11), right whale presence in the Bay did not exactly mirror these resources. The arrival of right whales in the Bay lagged behind the resource at the beginning of the season, and whales appeared to leave the Bay while the food resource remained relatively high. The apparent lack of a correlation between the food resource and right whale presence during the shoulder season of 2004 may reflect habitat-use patterns of right whales over a broader area than CCB.

Even so, the use of habitat parameters to forecast the likelihood of right whale presence, residency, and movement patterns in CCB is an important tool for right whale management. As a result, habitat assessment is being pursued and improved upon for the 2005 season with the acquisition of an Optical Plankton Counter (OPC) mounted on a remotely operated tow body. The tow body will not only house the OPC, but also a variety of oceanographic sampling equipment, including a CTD, fluorometer, PAR light meter, flowmeter, and dedicated depth sensor. The tow body with all its sampling equipment will be towed behind a vessel and programmed to sample the water column continuously throughout CCB, providing greater sampling resolution, and in a form readily (in near real-time) accessible and interpretable to managers.

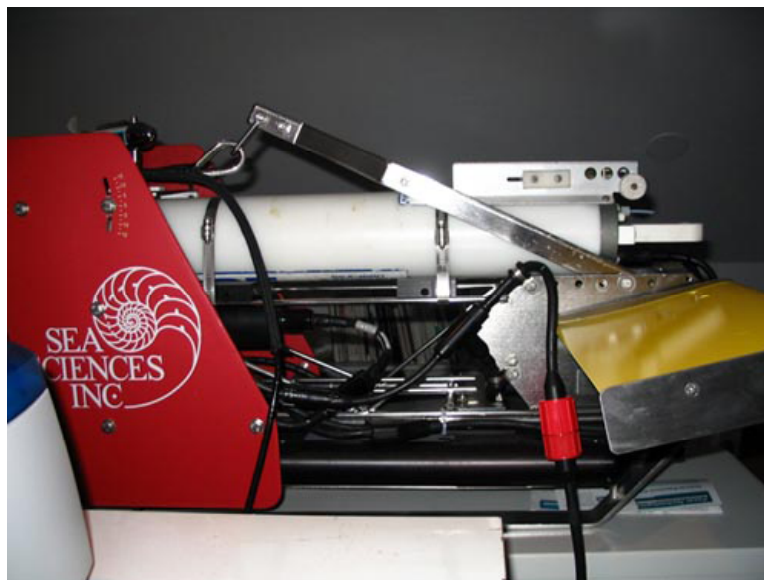


Figure 2. Tow body configured with oceanographic equipment.

CCS continues to synthesize its historical plankton monitoring data from Cape Cod Bay to complete a comprehensive analysis and publish their findings in peer-reviewed scientific journal. The CCS Habitat Monitoring report, as well as the near real-time cruise reports forecasting right whale presence, residency and movement patterns in CCB are included in [Attachment A](#).



**C. Collaboration and assistance in the use of archival and real-time passive acoustics to detect and monitor right whales in state waters: additional efforts to reduce the threat of ship strikes.**

*MarineFishes* has been collaborating with and assisting Dr. Christopher Clark of Cornell University's Bio-acoustic Research Program (BRP), for the past four years in monitoring right whales through the use of passive acoustic, archival "Pop-ups", in-situ devices that detect vocalizing right whales and store the detection for later retrieval and analysis. *MarineFishes*' support for Dr. Clark this past year included vessel charters for the deployment and retrieval of "Pop-ups" in CCB and southern Jeffrey's Ledge. During the fall and early winter of the 2003/2004 season, three Pop-ups were deployed in CCB and three on Jeffrey's Ledge. One of the Jeffrey Ledge Pop-ups was actually retrieved by the *MarineFishes*' Protected Species Specialist, operating a DMF-chartered vessel. Pop-ups were deployed in CCB from December 14, 2003 through May 31, 2004 for a total of 168 days of acoustic monitoring, while pop-ups were deployed on Jeffrey's Ledge and vicinity from September 22, 2003 through March 9, 2004 for a total of 168 days of acoustic monitoring. The data from these pop-ups is still being analyzed.



Figure 3. Real-time passive acoustic listening buoy deployed in Cape Cod Bay off Provincetown.

To improve the Commonwealth's Right Whale Conservation Program's ability to detect the presence of right whales continuously, year-round, and in near real-time in CCB Critical Habitat and surrounding waters, independent of environmental variables that might affect sighting conditions, *MarineFishes* acquired funding from NFWF, MET and NMFS to assist Dr. Clark

in developing and deploying two additional real-time, acoustic monitors in CCB. These two real-time monitors increase the total number of listening stations in CCB to three, providing nearly 100% coverage of CCB (temporally as well as spatially), but most importantly they address ship strike threat by providing coverage of the shipping lanes to and from the Cape Cod Bay canal, and the approaches to Provincetown. The use of the Cape Cod Bay listening array will also greatly improve the federal SAS system, and reduce costs and improve efficiency in the Commonwealth's Right Whale Conservation Program. If right whales are not heard in CCB, then *MarineFishes* and CCS can choose to not fly in the Bay or divert flights (resources) to other known or suspected right whale habitats, thus increasing coverage and photo-id opportunities.

On September 14, 2004 a real-time monitoring buoy was deployed in CCB off Provincetown from the *MarineFishes*-chartered vessel, F/V Survival, for preliminary testing of the buoy's listening and communication capabilities. Actual and synthesized right whale vocalizations were transmitted from underwater speakers at varying distances to determine whether, one, the buoy would detect the vocalizations and, two, whether the vocalizations would be transmitted to a computer back at Cornell University. All tests were successful.

Following the successful tests of the listening buoy, *MarineFishes* held two outreach forums regarding the use of acoustic monitoring of right whales in CCB. NMFS representatives attended both forums. The purpose of the forums (one held at Green Harbor on September 23; and the other in Scituate on November 1) was to educate fishermen on the use of the real-time acoustic buoys, to alleviate fears that the buoys would be used to further regulate fishing gear in the Bay, and to enlist their assistance as stewards of the Bay towards the goal of protecting right whales.

The two, *MarineFishes*-sponsored, real-time monitoring buoys, funded by NFWF and MET, along with the NMFS RWGP-sponsored buoy, were deployed in CCB on October 29, 2004. On December 10, 2004, Cornell and WHOI researchers carried out maintenance on the three CCB units; replacing failing batteries and addressing Verizon service failures (Starting in 2005, funds have been awarded to support maintenance of the two *MarineFishes*' acoustic buoys). Both problems were remedied and the three buoys are back to calling Cornell every 4 hours with reports of ambient noise data (right whales calls if they are there) with a 1 -minute resolution. To date (through December 22, 2004), no right whale vocalizations have been picked up by these buoys. Aerial surveillance flights performed during the month of December corroborates these findings with no right whales seen. A strong correlation has been shown between right whale sightings data from aerial surveillance and acoustic detections by pop-ups.





Figure 4. Location of Real-time, passive acoustic listening buoys in Cape Cod Bay.

Dr. Clark and Cornell University continue to work on their interactive website as a means to provide daily reports, and hope to have the website up and running early in 2005.

*MarineFishes* has requested and been awarded funds by MET to support the development of the interactive website.

#### **D. Locating potential right whale habitats through the surrogate, telemetry monitoring of similarly niched basking sharks.**

*MarineFishes* is tagging basking sharks, which have similar habitat requirements as right whales, as a means to locate potential right whale habitats and thereby right whales, especially during the fall and early winter when the location of much of the population is unknown. The hope is to learn more about right whales' distribution patterns, through the surrogate use of the basking sharks, and thereby avoid invasively tagging these extremely endangered animals. Notwithstanding, valuable information will also be gleaned on basking sharks, which themselves are listed as "federally prohibited" and for which very little is known regarding their movement patterns.

The study is deploying state of the art technology known as Pop-up Archival Transmitting (PAT) tags that collect temperature, depth, and light level data at user-defined time intervals. After a length of time, predetermined by the researcher, the tags detach from the animal, float to the surface, and transmit recorded data to an Argos satellite, which relays them to the researcher. The tag not only provides the location of the animal at the time of the pop-up, but also enables the re-creation of the shark's movements based on light level data collected by the tag. The Massachusetts Environmental Trust has supplied funding for six PAT tags. A collaborator, the University of New England, has recently purchased additional tagging platforms.

Tagging started in early August of 2004, with efforts in the Bay of Fundy, Stellwagen Bank, and the Great South Channel. To date, two of the six PAT tags have already been deployed. On September 24, 2004 two basking sharks were successfully tagged with the assistance of the University of New England, in the Great South Channel. These tags are programmed to collect environmental readings every 30 seconds and will release in mid-winter on January 31, 2005. The sharks' positions at this time will be revealed along with data revealing its habitat use. Tagging efforts will begin again in April, with target release dates during the late fall of 2005.

#### **E. Entanglement Threat:**

##### **1. Management and implementation of improved regulations to further reduce the risk of right whale entanglement in Massachusetts's fixed-gear fisheries.**

The state continues to aggressively, yet prudently, regulate fixed-gear fisheries in its waters. Since January 1, 2003 the use of floating groundline has been prohibited in the lobster fishery in Cape Cod Bay Critical Habitat (CCBCH). Starting in January 2004 of this past season this requirement was extend to cover the waters west of the CCBCH and south of Brant Rock. Lobster fishermen fishing in state waters other than the CCBCH must comply with at least one of the following gear restrictions/ modifications that includes: 1) all buoys be attached to surface lines by use of a 600 lb weaklink, 2) all buoylines composed entirely of sinking line, and/ or 3) groundlines be composed entirely of non-buoyant line. More detail on Massachusetts's regulations affording protection to the North Atlantic right whale, including the technology list, can be found within the Code of Massachusetts Regulations (322 CMR 12:00). A copy of which can be found in Attachment B. The Commonwealth continues to pursue ways to broaden the use of non-buoyant groundlines in the pot fishery throughout state waters and the range of the Northern Right Whale.

On April 27, 2004, the state took several precautions due to an unexpected large number of right whales observed by the aerial surveillance, and the presence of a rich food resource measured by the habitat monitoring team, which suggested the animals could remain in CCB for several weeks. First, to address the ship strike threat, the state issued an urgent warning to all mariners operating in Cape Cod Bay to be on the lookout for endangered right whales. Second, to address the entanglement threat, the state extended the fishing requirements that apply to Cape Cod Bay beyond the designated April 30 date to May 15. Attachment C contains a copy of the advisory.

## **2. Fixed-gear studies to better understand line profiles towards reducing risk of entanglement.**

### **a. Modeling:**

*Marine Fisheries* continued its gear modification research during 2004. Early in the year, *Marine Fisheries* completed a final report on the modeling of buoylines and groundlines to better understand the physics of their profiles in the water column and the threat of entanglement they may pose. The study was supported by a grant from and done in cooperation with the NMFS. The final report is available on the DMF website and is being published as a Massachusetts Technical Report.

### **b. Development of “optimal”, non-buoyant line for the offshore lobster industry:**

*Marine Fisheries* is presently working with the Atlantic Offshore Fishing Association (AOFA), the cordage industry, fishermen, and the NMFS in the first of its kind multi-year study to develop an “optimal” non-buoyant line for use by the offshore lobster industry to lower groundline profiles and thereby reduce the risk of entanglement. For the lobster industry, “optimal” will be lines that do not degrade due to abrasion from substrate contact, are strong enough to withstand hauling loads, and are not substantially more expensive than currently used rope products.

This project began in 2003 and is scheduled to be completed by late spring 2005. To date, a survey has been designed and mailed to over 700 pot fishermen from Maine to Virginia to canvass the fishing industry. More than 20% of these fishermen responded. Nine rope manufacturers are actively participating and have already fabricated and submitted for testing over 15 types (samples) of line as potential “optimal” non-buoyant groundline for the offshore lobster industry’s use.

In addition, a line testing machine that simulates some of the long-term wear and tear that lobster trawl lines experience in the field was completed in January. The tester comprises a 16” hauler working against an 11” diameter drum to simulate the hauling of line under load. The line then drops into a 12-foot long basin of sand and water in a relaxed state to simulate line laying on the sea floor. The cycle of hauling and relaxation is repeated for a set number of cycles before the line is tension-tested to provide a quantifiable comparison. The simulator/ tester is housed at the *Marine Fisheries’* Annisquam River Marine Station in Gloucester. During March and April, 17 preliminary test runs were made on the machine to establish testing protocols. However, analysis of these early test runs and the results of a meeting held with the cordage industry on April 28 determined that modifications to the testing machine were required to account for certain variables and reduce the affect of others. Some of these modifications, included the replacement of the brake hauler with the 11” diameter drum, mentioned above to reduce line slippage, the fitting of a helical plate around the drum to guide the test line, the replacement of the drive pump

with a higher capacity pump and sprocket system, the installation of a pressure reducer valve on the brake side to allow the power side to “haul” under greater loads, and the filling and plating of machine components to reduce machine wear. With these modifications, and others suggested by the fishing industry, protocol runs were resumed and another 23 test runs were made. In part, some of these preliminary runs were to establish a link with or a baseline with line use in the field. To this end, over 45 line samples representing lines retired by fishermen after use in the field were tension-tested to their breaking point by John Kenney of the NOAA Fisheries Gear Team. Beginning in September more than 20 test runs were performed on floating lines to determine at what load and for how many cycles (hauls) the machine needed to run (establishing a baseline and a connection between lines used in the field to those tested on the machine) to approximate the breaking strengths found for floating line in the field as determined by tension-tests.

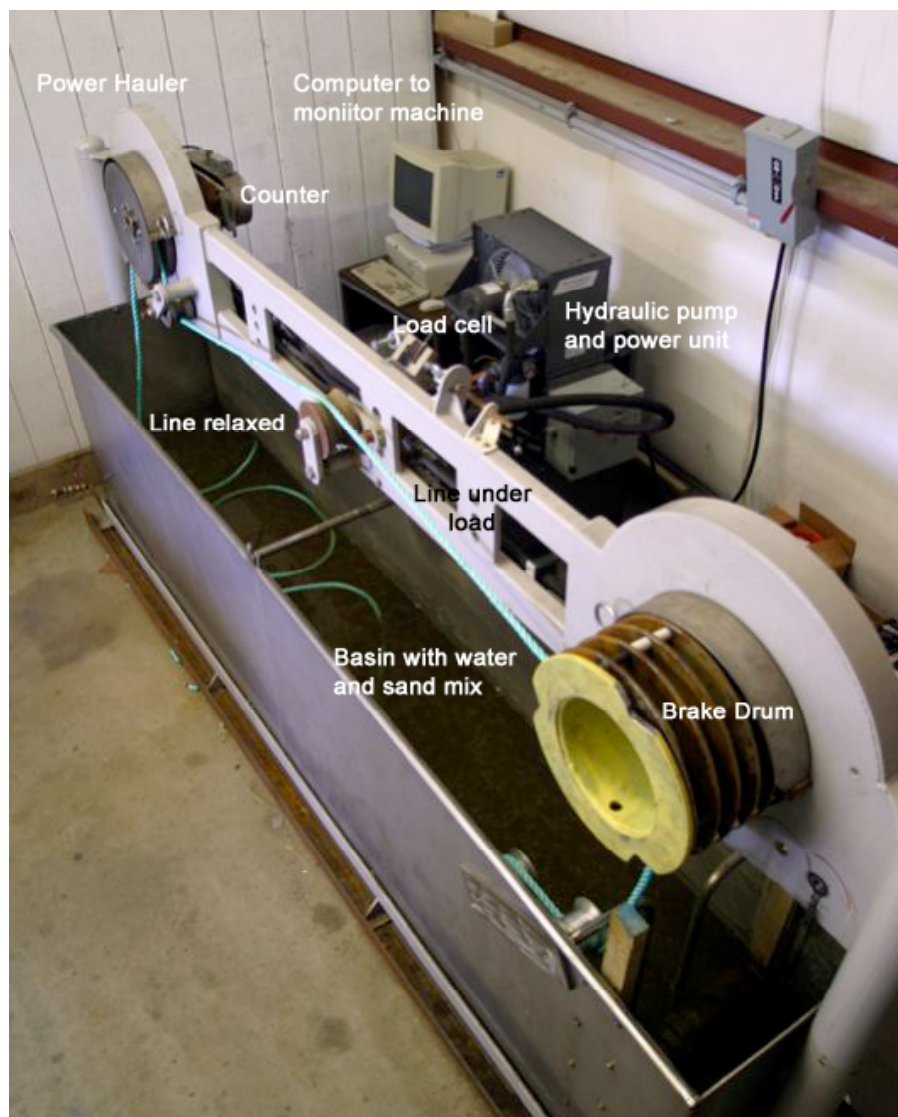


Figure 5. Line testing machine

To date nearly 140 hours of line testing and another 200 hours in modifying the testing machine have been logged. The effort has been successful and at this point, testing of sample “optimal” lines will begin in January with a goal of completion by April.

At the end of in-lab portion of the study, those sample lines that do well on the machine (lab testing) will be purchased and distributed among the offshore fishing industry for field-testing. A report will be submitted by April 30, 2005 outlining the results and findings of the lab portion of the study. The field-component of the study will continue throughout the remainder of 2005 at which time a final report will be submitted.

### **c. The use of mini-loggers to profile fixed-fishing gear:**

When addressing the entanglement threat, we ask two primary questions – where are the whales and where is the gear? The overlap of the two provides a measure of the threat. In answering the question for the whales, mainly sightings data, telemetry, and more recently passive acoustics, for distributional information on the horizontal plane are used. The vertical plane relies indirectly on mapping of the food resource and directly on telemetry data – like Dr. Mark Baumgartner’s work tagging right whales - to provide information on the right whales’ use of the water column. Here the same is being done, fishing gear is being tagged to answer the question of where the gear lies in the water column.

Originally ROV work was going to be used to document line profiles in two different, yet related, research projects. The first study, just described, would have used an ROV to profile buoyant lines presently being used by fishermen, and ground-truth the profiles of so-called “neutrally buoyant” groundlines. The second study, looking at fixed-gear in areas that right whales were found, would have used an ROV to quantify the profiles of fixed -gear and thus quantify their potential threat. However, in the interim, between the proposals and implementation, a new technology arose – the use mini-loggers, small, nearly neutrally buoyant, archiving pressure tags that could be attached to the gear in order to profile the gear continuously. This technology has since proven itself, allowing us to look at a greater number of gear configurations and under many more environmental conditions, than could have been otherwise been done by a fleet of ROVs. For the first time the dynamic nature of gear has been profiled. These mini-loggers have been used to not only profile groundlines, but buoylines as well.

To date 28 DST-Milli loggers from Star-Oddi have been purchased for \$350 each. They have been deployed for over 315 days in 49 different sets (27 inshore; 22 offshore), covering 15 different gear configurations, fished by 9 different fishermen (5 inshore; 4 offshore). This works out to \$31/ logging-day or \$200/ set. Even at this early stage in their use the cost effectiveness of the loggers and their ability to provide more data than the ROV work, is quite apparent.





Figure 6. Mini-logger used to profile fishing gear.

Loggers were attached to two buoyline sets in the field for 24-hour periods to compare full-scale buoylines comprising 1/3 float line at their bottom terminus to the scale-modeled configurations done in the flume tank at Memorial University in St. Johns, Newfoundland. The results of the full-scale profiles, as shown by the attached loggers, supported the modeling work, further indicating that the use of float line at the bottom of otherwise sink buoyline does not significantly change the profile of the line over time compared to a vertical line comprised entirely of sink line.

To date, the loggers indicate that floating groundline used in the inshore and offshore lobster industries lie on average 7 and 13 feet of the bottom respectively. However, groundline profiling has confirmed that there is a large degree of variation resulting from different configurations, the way the gear is set, and environmental conditions, such as sea state, tidal current, and depth. For instance, thus far, inshore floating groundlines range from 0 to 21 feet off the bottom, while offshore floating groundlines range from 0 to 45 feet.

On the other hand, the profiling of neutral-buoyant lines to date has shown that they indeed lie on or very near the bottom (within 2 feet). While so-called neutral buoyant lines, which have a specific gravity very near to that of seawater, are theoretically neutral, they sink to the ocean floor in most cases. In fact, the Commonwealth of Massachusetts has recently amended its CMRs to define/ classify these neutral-buoyant lines as “non-buoyant”. Because there is a fine line between a line that sinks and one that floats, it is still important to profile or ground-truth these lines in the field where they may be subject to different salinities, temperatures, pressures, fouling, and impregnation of material, to make sure that they are indeed lying on or near the bottom.

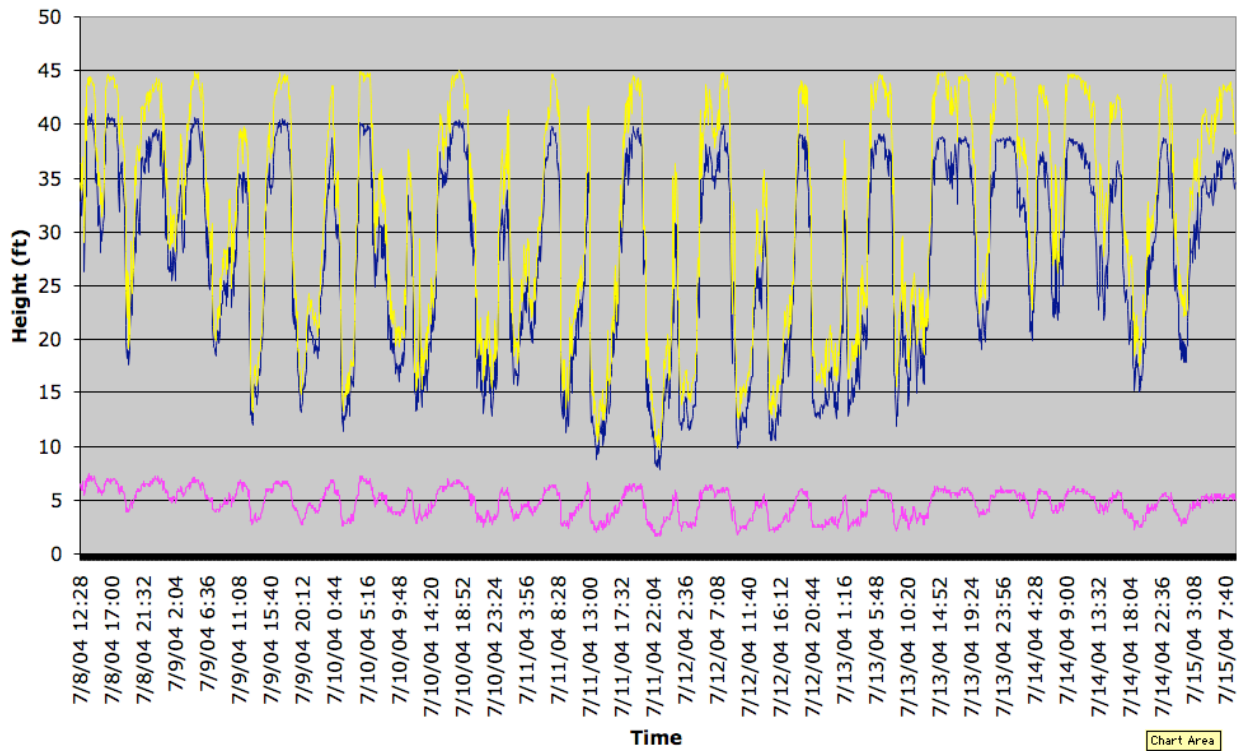


Figure 7. Example of groundline arcs (in yellow and blue) and gangion (red) heights depicted over time for offshore lobster trawl gear.

In regard to the second study, the profiling of fixed-fishing gear in the vicinity of right whale concentrations to ascertain entanglement threat, it has already been mentioned that there is a large degree of variation out there in the profiles of this gear and thus their potential threat. So rather than attempt to profile the gear in near real-time synchronically with the right whales' distribution, which in itself would be a logistic and expensive undertaking, providing, in the end, only a snapshot of the gear's profile, we are profiling or mapping the different gear types over time and under the various environmental conditions that influence how fixed gear lies in the water column. In the end, we will have a better understanding and more precise view of the dynamic nature of gear profiles in the water column and the potential threat they pose.

### 3. Research on the overlap between North Atlantic right whales and fixed-fishing gear in the water column

As already mentioned above, Dr. Mark Baumgartner at the Woods Hole Oceanographic Institution is investigating the diving and foraging behavior of North Atlantic right whales in the western Gulf of Maine to complement the in-situ gear research of *Marine Fisheries*. This collaboration will allow us to identify overlap between whale diving behavior and fishing gear so that those gear elements that pose the greatest risk of entanglement can be identified and modified. During the spring of 2004, 6 right whales were tagged with a suction-cup mounted archival tag designed to monitor the whales' diving behavior. Whales were tagged during a 4-week cruise aboard the NOAA Ship Albatross IV and during a single day trip on the R/V Tioga.



Attachment durations during the Albatross IV cruise were unusually short ( $< 10$  minutes) owing to the addition of a new instrument that made the tag too large and heavy. The tag was redesigned and the new tag remained attached for  $\sim 1$  hour during the R/V Tioga trip. Right whales remained near the surface for most of the deployments, but one of the tagged whales dove to and remained at the sea floor for almost 4 minutes (Figure 8). These preliminary data suggest that right whales may be at risk from gear elements both at the surface (high fliers, surface buoys, floating rope) and near the sea floor (floating lines). Dr. Baumgartner has been funded to continue this study in 2005-2007 by the NOAA Right Whale Research Grant program, so a much more complete dataset on right whale diving and foraging behavior in the western Gulf of Maine will be compiled and analyzed.

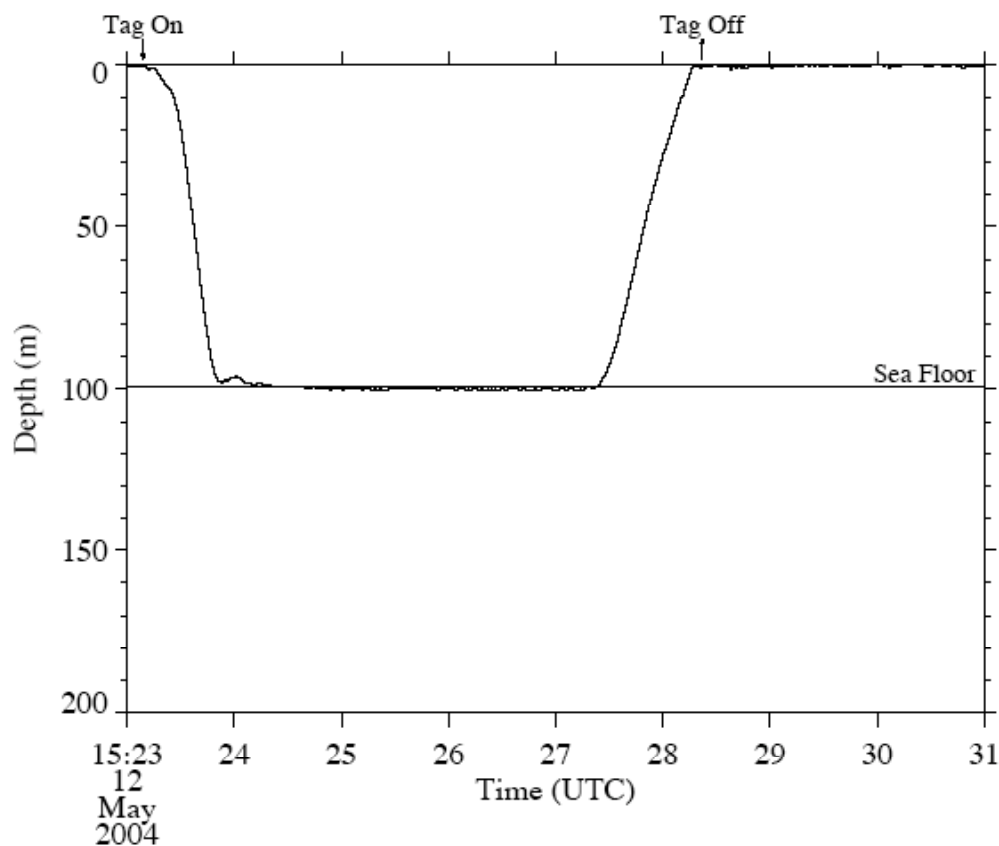


Figure 8: Profile of Tagged Right Whale – May 12, 2004

#### 4. Gear buyback assistance

As of this year, lobster fishermen throughout Cape Cod Bay are required to use a non-buoyant groundline year-round, while other Massachusetts inshore fishermen are likely to replace their floating groundline with non-buoyant line in the next year or so. To help ease this transition, *MarineFisheries* collaborated with the International Fund for Animal Welfare (IFAW) and the Massachusetts Lobstermen's Association (MLA) in the first-ever gear replacement program.

The program, directed and organized by IFAW and the MLA, is providing substantial financial assistance to Massachusetts inshore lobstermen to help replace floating groundline with a non-buoyant, “whale-safe” alternative. The buyback program will also be open to fishermen who recently switched to a non-buoyant groundline and still have their floating line to turn in. Fishermen who responded to a buyback program questionnaire earlier this year indicated that they will turn in more than 220 tons -- 3,500 nautical miles -- worth of floating groundline when the program begins in the fall. To date, 6 exchange dates have been carried out from Gloucester to Sandwich, MA. Two additional days are scheduled for January 22 – 23, 2005. *Marine Fisheries* spent a great deal of time performing mailings, designing databases, inputting and compiling data, and providing advise and logistical support for the program. Funding for the program was received from NFWF.



Figure 9. Fishermen turn in floating line in exchange for vouchers towards purchase of non-buoyant, “whale-safe” alternative line.

## **5. Support of disentanglement efforts**

The Commonwealth continued to support the efforts of the Disentanglement Network. Ed Lyman is a high-level (level 5) disentangler and first responder and is strategically located in the north shore area of Massachusetts to respond to events. In addition to participating in actual disentanglement events on a case-by-case basis, Lyman performed valuable outreach and training on the topic of disentanglement. Lyman documented entangled right whales on March 24 in CCB and on November 23 on southern Jeffrey's Ledge, and participated in meetings and discussions regarding entangled right whale Kingfisher and the right whale re-sighted entangled of Georgia in late December. The Massachusetts Division of Law Enforcement (DLE) has offered to assist disentanglement efforts by providing on-the-water support to respond to reports of entangled, endangered whales, and in the event of a rescue effort, stand by. DLE, if necessary, will also transport rescue team members.

## **F. Education Efforts (Outreach)**

*Marine Fisheries'* staff continued ongoing public education efforts regarding Right Whale Conservation and the Massachusetts Conservation Plan throughout 2004 by meeting with industry groups, fielding calls, and lecturing in public forums. *Marine Fisheries'* Edward Lyman and Dan McKiernan wrote articles in the prominent trade journal, *Commercial Fisheries News*, on the state's efforts with the AOLA to come up with an optimal non-buoyant groundline for the offshore pot fishery, and real-time acoustic monitoring of Cape Cod Bay for right whales. These articles, as well as others, were also published in the DMF newsletters and on the DMF website. Copies of the CFN article and the DMF newsletter are included in Attachment D. In addition, the Right Whale Conservation Program page of the *Marine Fisheries* website was completely rewritten and upgraded. *Marine Fisheries'* staff attended various fishermen's meetings, trade shows, and conservation meetings promoting the Conservation Plan. Formal presentations were given in many of these meetings and shows.

DMF's Dan McKiernan, the Director of the Commonwealth's Right Whale Conservation Program, is a member of the Atlantic Large Whale Take Reduction Team (ALWTRT). Ed Lyman, the Coordinator of the Right Whale Conservation Program, was a member of Stellwagen Bank National Marine Sanctuary's Entanglement Workshop Team. Outreach efforts are listed in Attachment E.

## **IV. ACTION PLAN FOR 2005 AND FUNDING SOURCES.**

The Commonwealth, along with its contractor CCS are working to improve upon the 2005 Right Whale Surveillance and Habitat Monitoring Program. *Marine Fisheries* has acquiring an Optical Plankton Recorder (OPC) and a remotely steerable tow body to hold an array of oceanographic sampling equipment, including the OPC. Funds amounting to \$421,854 to support the aerial

surveillance and habitat monitoring of CCB for the 2005 season has already been awarded by the NMFS.

*Marine Fisheries* has also received \$151,776 from NFWF for 2005 to continue support of their Program Manager / Protected Species Specialist, outreach program, gear modification work, and collaborations with the use of passive acoustics. The Right Whale Conservation Program will finish research into development of an optimal line for the offshore lobster industry in 2005.

*Marine Fisheries* will continue collaborating with Dr. Clark in the use of both archival and real-time passive acoustics to detect right whales. Funds have been awarded by NFWF (\$68,335) and MET (\$36,475) to support buoy maintenance and web-based dissemination of right whale detections from the real-time passive acoustic listening buoys.

*Marine Fisheries* will continue to collaborate with Dr. Mark Baumgartner of Woods Hole Oceanographic Institute to quantify the right whales' use of the water column in order to identify what gear types and gear components may pose the greatest risk of entanglement to the North Atlantic right whale. In particular, we are interested in examining how right whale diving behavior overlaps with fishing gear in the water column. By identifying those gear types or elements that are at greatest risk of interaction with right whales, we hope to focus gear modification efforts to reduce or eliminate entanglements.

#### **List of Attachments:**

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|----------------------|--|
| <b>Attachment A)</b> | <b>Surveillance Monitoring and management of North Atlantic Right Whales in Cape Cod Bay and adjacent waters - 2004. Final Report.</b>   |
| <b>Attachment B)</b> | <b>Current Massachusetts regulations (322 CMR 12:00) regarding fishing regulations in Cape Cod Bay.</b>                                  |
| <b>Attachment C)</b> | <b>Advisories and notices posted by Commonwealth regarding Cape Cod Bay critical Habitat and endangered North Atlantic right whales.</b> |
| <b>Attachment D)</b> | <b>Commercial Fisheries News article and DMF newsletter</b>  |
| <b>Attachment E)</b> | <b>Outline of outreach efforts</b>   |